

10/574657

PCT/JP2004/014740

1AP20 Reg'd PCT/PTO 04 APR 2006

*English translation of the Amendment under PCT Article 34 filed on April 25, 2005

DESCRIPTION

- 1) In the line 14 of page 34, "sprags 143" must be changed to "sprags 142."
- 2) In the line 10 of page 34, " a sprag clutch 144" must be changed to "a sprag clutch 143." And in the line 20 of page 34, " the sprag clutch 144" must be changed to "the sprag clutch 143."

CLAIMS

- 1) Claim 1 must be amended as in the attached sheets.
- 2) Claim 5 must be canceled.
- 3) Claim 6 must be canceled.
- 4) Claim 7 must be canceled.
- 5) Claim 8 must be amended as in the attached sheets.
- 6) Claim 9 must be amended as in the attached sheets.
- 7) Claim 10 must be amended as in the attached sheets.
- 8) Claim 11 must be canceled.
- 9) Claim 12 must be canceled.
- 10) Claim 13 must be canceled.
- 11) Claim 14 must be canceled.

controlling the vane angle of the impeller 31, it is possible to lower the waterfall difference, providing the same effect as if the rotational speed of the pump 30 is lowered, even if the rotational speed of the pump 30 is
5 constant.

In each of the above embodiments, the transmission 70 has the brake 30 as the reversal prevention mechanism, as shown in FIG. 18. However, as shown in FIG. 19, the reversal prevention mechanism may comprise a one-way clutch
10 such as a sprag clutch 143 or the like, rather than the brake, having an inner race 140 fixed to the output shaft 73 of the transmission 70, an outer race 141 fixedly disposed in a position surrounding the circumference of the inner race 140, and sprags 142 disposed between the inner race 140
15 and the outer race 141 for allowing the inner race 140 to rotate in one direction and preventing the inner race 140 from rotating in the other direction. When the pump 30 is about to rotate reversely, the output shaft 73 of the transmission 70 is locked against rotation by the one-way
20 clutch such as the sprag clutch 143 or the like, thus preventing the actuating means 60, which may be an internal combustion engine or an electric motor, from being reversed.

As shown in FIG. 20, the transmission 70 may have a clutch 145 disposed as a reversal prevention mechanism
25 between the input shaft 71 and the output shaft 73 of the transmission 70. In response to e.g. an actuator emergency stop signal or a stop signal from a low-speed detector which is disposed on an actuator shaft for detecting the

CLAIMS

1. (Amended) A water-lifting pump apparatus comprising:

a suction tank;

5 a discharge tank;

a pump for pumping water in said suction tank into said discharge tank, and a discharge piping connected to a discharge side of the pump;

10 actuating means for driving said pump and controlling a rotational speed of said pump;

a reverse flow preventing mechanism for preventing a reverse flow of water pumped into said discharge tank toward said discharge piping; and

15 back flow rate control means for controlling a rotational speed of said pump while keeping the pump rotation in a normal direction such that reverse water flows in said pump within the limits of allowing vibrations of said pump based on a detected value of a pressure, a water level, or a flow rate of water in said discharge piping
20 falling from said suction piping into said suction tank when pumping operation is finished, thereby to lower the water level gradually in said discharge piping.

2. A water-lifting pump apparatus according to claim 1,
25 wherein said reverse flow preventing mechanism comprises an overflow mechanism having a dam disposed in said discharge tank.

3. A water-lifting pump apparatus according to claim 1,
wherein said reverse flow preventing mechanism comprises a
reverse flow prevention valve disposed on a distal end of
5 said discharge piping.

4. A water-lifting pump apparatus according to claim 1,
wherein said reverse flow preventing mechanism comprises a
siphonic pipe disposed in said discharge piping.

10

5. (Canceled)

6. (Canceled)

15

7. (canceled)

8. (Amended) A water-lifting pump apparatus comprising:
a suction tank;
a discharge tank;

20

a pump for pumping water in said suction tank into said
discharge tank, and a discharge piping connected to a
discharge side of the pump, said pump having a movable vane
mechanism for adjusting the vane angle of an impeller;

a reverse flow preventing mechanism for preventing a
25 reverse flow of water pumped into said discharge tank toward
said discharge piping; and

back flow rate control means for adjusting the vane

angle of said impeller of said pump such that reverse water flows in said pump within the limits of allowing vibrations of said pump based on a detected value of a pressure, a water level, or a flow rate of water in said discharge piping falling from said suction piping into said suction tank when pumping operation is finished, thereby to lower the water level gradually in said discharge piping.

9. (Amended) A water-lifting pump apparatus according to any one of claims 1 through 4 and 8, further comprising:
a reversal prevention device for preventing said actuating means from being reversed.

10. (Amended) A method of controlling operation of a water-lifting pump apparatus for pumping water in a suction tank into a discharge tank with a pump and a discharge piping connected to a discharge side of the pump, comprising:

after the pumping operation is finished, detecting a pressure, a water level, or a flow rate of water in said discharge piping falling from said discharge piping into said suction tank; and

controlling a rotational speed of said pump while keeping the pump rotation in a normal direction such that reverse water flows in said pump within the limits of allowing vibrations of said pump based on said detected value, thereby to lower the water level gradually in said

discharge piping.

11. (Canceled)

5 12. (Canceled)

13. (Canceled)

14. (Canceled)